



# Automotive Technology Update

## In-Car Maintenance Reminders

### Need to Know

- Proper maintenance is vital for automobile safety, reliability and longevity.
- Many methods are used to remind drivers when vehicle maintenance is needed.
- Most newer vehicles are equipped with an in-car maintenance reminder system.
- Simple reminder systems are based on vehicle miles traveled.
- More sophisticated reminder systems monitor vehicle operating conditions.
- The most advanced reminder systems can assess oil quality in real time.
- When a reminder system calls for an oil change, other services are also required.

### Introduction

Proper maintenance has always been critical to ensuring automobile safety, reliability and longevity. Over the years, reminders to perform necessary vehicle maintenance have been provided in owners' manuals and maintenance booklets, on stickers

attached to the vehicle door jamb or windshield, via "service due" postcards and letters, through internet applications, and in emails or texts sent by repair shop management software or automaker telematics systems. These reminders should make it easy for drivers to properly care for their cars, but conflicting service recommendations from repair shops, automakers and others still make it challenging for motorists to know when work is needed.

Enter the in-car maintenance reminder system, which provides a dashboard alert when the time for service is near. These reminders key off the need for an oil change, the most frequently required type of maintenance, but other factory-



An in-car maintenance reminder alert. (Image: General Motors)

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### What is an ATU?

AAA Automotive Technology Updates (ATUs) provide expert information on a variety of topics related to modern vehicles. Some feature in-depth answers to common questions about automobile use and maintenance. Others explore new technologies in today's rapidly evolving automobiles. For additional information, visit [www.AAA.com/autorepair](http://www.AAA.com/autorepair).



recommended services must be done at the same time. Most cars also need additional time- or mileage-based maintenance services that are usually *not* prompted by the reminder system. This means that while maintenance reminder systems are useful for indicating *when* service is required, other resources are still needed to identify *what* needs to be done.

As of early 2019, at least 16 automakers offer maintenance reminder systems in their cars. In a AAA survey, six out of ten motorists (63%) said their cars have a built-in system that alerts them when it is time to change the oil and perform other services. What's more, 51 percent of motorists whose cars have reminder systems say that they adhere to the computer-recommended maintenance intervals.<sup>1</sup>

### Maintenance Reminder Benefits

By providing an indication of when maintenance is due, reminder systems free vehicle owners from having to track the time and/or mileage between most services. Some in-car reminder systems can also eliminate the question of whether a vehicle is driven in "normal" or "severe" conditions, which affects the required maintenance intervals. In fact, the owners' manuals for many cars with reminder systems no longer even mention severe service – they simply tell the vehicle owner to perform the required maintenance when instructed by the reminder system.

Another benefit of in-car maintenance reminder systems is that they help vehicle owners avoid over maintenance. While some drivers consciously choose to service their vehicles more frequently than the factory recommends, many repair facilities still recommend too-frequent oil changes and other services that may or may not be called for by vehicle manufacturers.<sup>2</sup> Maintenance reminder system service intervals are based on extensive testing by automakers to determine when service is really necessary to ensure reliable vehicle operation and a long service life. While over maintaining a car will not hurt the vehicle, it will put an unnecessary dent in one's pocketbook.

Nonetheless, old habits die hard and some motorists raised on a regimen of 3,000-mile oil changes have a difficult time accepting that modern vehicles can safely travel much farther between services.

Doubters may be reassured by two facts. First, oil quality testing has shown that when a maintenance reminder system indicates the need for service there can be up to 2,000 miles of oil life remaining.<sup>3</sup> And second, automakers are so sure of their reminder systems' accuracy that the service intervals recommended by those systems are sufficient to maintain the vehicle powertrain warranty, which on some cars can be as long as 10 years or 100,000 miles.

*While maintenance reminder systems are useful for indicating when service is required, other resources are still needed to identify what needs to be done.*



**Too-frequent oil changes can be avoided with a maintenance reminder system.** (Image: City of Chula Vista)



## Maintenance Reminder Types

There are two basic types of maintenance reminder systems in vehicles today, those based on miles traveled and those that determine service intervals by monitoring engine operating conditions. The owner's manual will describe the reminder system of any given vehicle. Mileage-based systems are typically programmed with the desired distance between maintenance services. Systems that use engine operating conditions to determine maintenance intervals do not require presetting a distance.

As discussed above, the maintenance intervals recommended by reminder systems are inherently conservative to ensure that vehicles do not suffer accelerated engine wear or damage. However, when a maintenance alert does appear, it is best to schedule service at the earliest convenient opportunity. General Motors suggests that the oil change and other needed operations be performed within two tanks of gas once the maintenance reminder message is displayed. In addition, service should *always* be performed before an extended road trip if the reminder light is illuminated or the indicated oil life is low (see below).

Maintenance reminders are usually simple warning lights or text messages that appear on the dash. Some reminders count down the percentage of remaining oil life while others display messages such as "MAINTENANCE REQUIRED," "CHANGE ENGINE OIL SOON" or "CHANGE ENGINE OIL NOW." Systems that show the oil-life percentage remaining will sometimes display a negative number when service is overdue.

Most maintenance reminder systems display a warning light or text message when the engine is first started as an indicator of proper system operation. During normal driving, some reminder systems can display the remaining oil life on request, but others are invisible until they announce the need for service.

## Mileage Counters

Maintenance reminders based on mileage have been around for a long time. The first Honda Accord in 1976 had a mechanical system with three green indicators in the speedometer that turned red when the number of miles traveled called for a tire rotation, an oil change or oil filter replacement. The indicators were reset by inserting the vehicle key into slots below the speedometer.

Electronic mileage-based maintenance reminder systems began to appear in the 1980s, around the same time as digital odometers. All of these systems operate in the same basic way. Based on criteria in the owner's manual, it is determined whether the driver operates his/her vehicle under "normal" or "severe" service conditions.<sup>4</sup> Then, following instructions also found in the manual, the reminder system is set to the recommended mileage interval by choosing one of several default values. Some reminder systems can store different mileage intervals for several services, similar to the older Honda system described above.



**A maintenance required warning light.** (Image: Samantha Celera, CC BY-ND 2.0)



**A maintenance reminder system that displays remaining oil life.** (Image: Honda)



Once configured, the maintenance reminder system will count down the miles remaining since the last system reset. When the preset mileage for a particular service is approaching, a maintenance due warning light or text message will be displayed on the instrument panel. After any needed work has been performed, the system is reset (see later section) and the process begins anew.

### Operation Monitors

Mileage-based maintenance reminder systems work well, but their recommended service intervals are still based on an educated guess of how often an oil change should be performed. For more informed recommendations, increasing numbers of new cars are being equipped with electronic maintenance reminder systems that monitor vehicle operating conditions and use computer algorithms, based on millions of miles of driving and extensive oil analysis, to decide when the maintenance reminder alert should be displayed.

The Service Interval Indicator (SII) system introduced on 1982 BMWs was one of the first operation-based maintenance reminder systems, and General Motors began widespread deployment of its well-known Oil Life System (GMOLS) in 1988. Other automakers have since followed suit. Some common operating conditions monitored by these systems include engine hours, trip times, cold starts, coolant temperature, ambient air temperature, engine rpm, engine load and more.

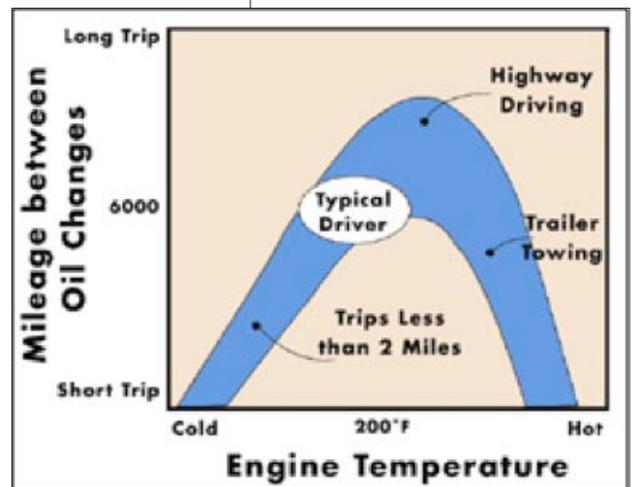
Depending on the vehicle, the recommended engine oil type and individual driving behavior, the oil change intervals specified by operation-based reminder systems can vary anywhere from 3,750 to 15,000 miles.<sup>5</sup> Reminders for vehicles that use conventional or semi-synthetic oils typically occur between 5,000 and 8,000 miles, while the intervals for cars that require full-synthetic oil are usually somewhat longer.

Regardless of mileage, most automakers recommend that the oil be changed at least once a year to ensure proper engine protection. Some maintenance reminder systems will trigger an alert after 12 months if other necessary criteria for requiring service have not been met. However, other systems do not display time-based alerts and it is the responsibility of the vehicle owner to make sure an annual oil change service and reminder system reset are performed.

As alluded to earlier, a critical factor with operation-based maintenance reminder systems is oil type and quality. The algorithms employed to calculate maintenance intervals are based on the use of engine oils that meet the automakers' specifications. If a lesser product is installed – for example, if conventional oil is used in an engine that calls for full-synthetic – the reminder system has no way to know. In such a case, it is possible the conventional oil may break down, causing accelerated engine wear or damage before the reminder system indicates it is time for an oil change.

### Oil Quality Sensors

Operation-based maintenance reminder systems like those just described are superior to mileage-based systems, but they still cannot directly recognize lubricant breakdown or contamination. To do that, the most sophisticated reminder systems add an oil quality sensor. Two types of these sensors are now in use. One measures an oil's dielectric constant, the other measures the oil's permittivity.<sup>6</sup> Without



**A graph showing the effect of engine temperature on oil life. This is one of many variables considered in an operation-based maintenance reminder system.** (Image: General Motors)

**An oil quality sensor.** (Image: Marship)





getting into the technologies involved, suffice it to say that both sensor types provide the maintenance reminder system with an input signal that increases as the oil breaks down, additives become depleted or contamination from fuel or engine coolant occurs.

Oil quality sensors are often part of a multi-function assembly that measures oil temperature and level in addition to condition. With appropriate programming, oil quality sensors can measure other oil traits as well. For example, the latest Mercedes oil quality sensors can measure oil viscosity based on the movement of oil in the oil pan.<sup>7</sup>

Because they provide real-time information on engine oil condition, oil quality sensors typically allow longer oil change intervals. For example, Mercedes says the oil quality sensor in its Flexible Service System (FSS), combined with the required use of full-synthetic oil, allows maintenance intervals to be increased up to 25 percent. Oil change reminders at 12,000 to 15,000 miles are not uncommon for Mercedes vehicles, and others fitted with oil quality sensors.

## Additional Required Services

Maintenance reminder systems have made life easier for motorists, but extended service intervals can lead to vehicle problems if basic checks and inspections are not performed on a regular basis. The engine oil level and tire air pressures should be checked monthly to ensure vehicle occupant safety and powertrain longevity. Owners who are unwilling or unable to perform these important inspections should have them done regularly by a third party.

As mentioned previously, when a maintenance reminder system calls for an oil change that is not the only work that needs to be done. Most vehicle manufacturers use some variation of a two-tiered maintenance schedule. The first time the maintenance reminder comes on (Service 1 or A), the vehicle requires an oil change and tire rotation along with some basic inspections. The next time the service reminder appears (Service 2 or B), the vehicle needs the first-level services, additional operations, and a more extensive list of inspections. The owner’s manual or maintenance booklet will list the factory recommended services for each maintenance interval.

Services 1/A and 2/B continue to alternate for the life of the vehicle, but there are additional service operations that need to be performed on a mileage, time or “as needed” basis. The accompanying illustration shows a list of common maintenance procedures that are called for at extended intervals. For engines that use a timing belt, replacement of the belt is usually recommended between 60,000 and 105,000 miles, or between 6 and 10 years regardless of mileage. The specific recommendation for a given vehicle will be found in its owner’s manual or maintenance booklet.

Typical schedule 1/A and 2/B maintenance operations. (Image: AAA)

Maintenance 1/A
<b>Perform when "Change Engine Oil" light comes on the first time, or when Maintenance 2/B was the last schedule used.</b>
● Change engine oil and filter
● Reset oil life system
● Inspect engine air cleaner filter - replace as needed
● Rotate tires and check inflation pressures and wear
● Inspect brake system
● Check engine coolant level - top up as needed
● Check windshield washer fluid level - top up as needed
● Perform any needed additional services

Maintenance 2/B
<b>Perform when "Change Engine Oil" light comes on and Maintenance 1/A was the last schedule used.</b>
● In addition to Maintenance 1/A operations:
● Inspect suspension and steering components
● Inspect the engine cooling system
● Inspect the wiper blades - replace as needed
● Inspect restraint system components
● Lubricate body components
● Inspect the throttle system
● Perform any needed additional services

Additional Required Services		
Perform based on mileage or time, whichever comes first, or earlier if needed.	Mileage	Time
● Replace cabin air filter	22,500	24 months
● Inspect evaporative control system	45,000	---
● Replace engine air cleaner filter	45,000	48 months
● Replace spark plugs and inspect plug wires	60,000	---
● Flush engine cooling system and replace coolant	150,000	60 months
● Inspect accessory drive belts	150,000	120 months
● Flush brake system and replace fluid	---	60 months

Typical extended mileage- and time-based maintenance operations. (Image: AAA)



Honda's mileage-based Maintenance Minder system is unique in using service letters (A and B) that are combined with numbers that indicate when certain additional work is needed. However, even with this system it is necessary to consult the owner's manual or maintenance booklet to identify the services designated by the alphanumeric codes.

### Service Reminder Resetting

Any time the oil is changed on a vehicle with an in-car maintenance reminder, the system must be reset to ensure that the next alert will be displayed at the appropriate time. Reset procedures vary widely from one make of vehicle to the next, and often between different car models or even trim levels from the same automaker. A few systems can only be reset using an engine control system scan tool or a dedicated maintenance reminder system reset tool. BMW is the car make most well known for requiring a reset tool. However, the majority of systems today can be reset by following instructions that are provided in the vehicle owner's manual.

Typically the reset procedure involves some combination of turning on the ignition and pressing the accelerator pedal several times, or pressing certain buttons on the dash. Most reset procedures are done with the key on and the engine off, but some must be done when the engine is running. In many cases, the required series of actions must be completed within a specified timeframe or the reset will fail and the process must be repeated.

Performing a maintenance reminder system reset is not difficult, but it does require following the instructions precisely. Before attempting a reminder reset, read the directions thoroughly, have a full understanding of all steps in the process and make sure any preconditions (such as having the car doors, hood and trunk closed) have been met. In addition to the owner's manual, reminder system reset procedures can be found in YouTube videos, on websites such as [www.oilreset.com](http://www.oilreset.com), and via mobile apps such as Oil Reset Pro, Reset Oil Service Pro and others.



**A Honda Maintenance Minder system indicating it is time for a basic (A) service and a transmission fluid (3) service. (Honda).**



**A maintenance reminder reset on this Toyota requires pressing the ignition and trip meter buttons in a specific sequence. (Image: Toyota)**



## Endnotes

- 1 *AAA Vehicle Maintenance Habits Omnibus Survey*, September 2012
- 2 *Wallet Flushes*, California Bureau of Automotive Repair, February 2013
- 3 *Oil Life Monitoring Systems*, Edmunds, August 24, 2010, <https://edmu.in/2ljzYWo>
- 4 *Oil Changing Tips: How Often Should I Change My Oil?*, The Car Connection, <https://bit.ly/2ITrBC6>
- 5 *Understanding vehicle maintenance needs is challenging for motorists*, AAA NewsRoom, <https://bit.ly/1rNPtqm>
- 6 *Oil Quality Sensor*, MEL Systems, <https://bit.ly/2ZNv0qX>
- 7 *Mercedes-Benz's new oil sensor can keep you driving safely on old oil longer*, AutoBlog, Sebastian Blanco, May 12, 2008, <https://bit.ly/2UOg9c9>

## To Learn More *Links to relevant online articles and other resources, including:*

### AAA SITES

***Advanced Maintenance Technology Simplifies Proper Car Care Says AAA***, AAA NewsRoom, January 25, 2013  
<https://newsroom.aaa.com/tag/maintenance-reminder-systems>

***Understanding vehicle maintenance needs is challenging for motorists***, AAA NewsRoom, October 2, 2014  
<https://bit.ly/1rNPtqm>

### AUTOMAKER SITES

***Intelligent Oil-Life Monitor™ (IOLM)***, Ford  
<https://ford.to/2G7zhxD>

### SUPPLIER SITES

***Oil light reset tool kit***, OTC  
<https://www.otctools.com/products/oil-light-reset-tool-kit>

***Oil Quality Sensor***, MEL Systems  
[www.mel-systems.it/en/sensore-di-qualita-2](http://www.mel-systems.it/en/sensore-di-qualita-2)

### PROFESSIONAL SITES

***Trouble Shooter***, MOTOR, January 2018  
<https://bit.ly/2UUKhaT>

***Maintenance Reminder Systems Go Mainstream***, MOTOR, February 2006  
<https://bit.ly/2G8z9Ov>

***Ready, Reset, Go!***, MOTOR, February 2017  
[www.motor.com/magazine-summary/ready-reset-go](http://www.motor.com/magazine-summary/ready-reset-go)

***How To Reset An Oil Change Light***, NAPA, May 9, 2018  
<http://knowhow.napaonline.com/how-to-reset-an-oil-change-light>

***How To Reset Oil Life After Every Oil Change***, Speedfinal  
<https://speedfinal.com/how-to-reset-oil-life>

### REFERENCE SITES

***Reset automotive service, oil life, index and maintenance lights***, oilreset.com  
<https://oilreset.com>

***Oil Life Monitor Reset Procedures***, Squarespace  
<https://bit.ly/2UI29LQ>

### MEDIA SITES

***Service Reminder Light***, Motorist Assurance Program  
<https://www.motorist.org/2019/04/08/service-reminder-light>

***GM Oil Life System***, Police Fleet manager  
<https://bit.ly/2V92emj>

***Oil Life Monitoring Systems***, Edmunds, August 24, 2010  
<https://edmu.in/2ljzYWo>

***Oil life monitors: Should you trust them?***, Driving, May 25, 2015  
<https://bit.ly/2IWmVuW>

***Understanding Chevrolet Oil-Life Monitor System and Lights***, Brent Minderler, August 31, 2016  
<https://bit.ly/2VE2OUY>

***What does the oil change indicator light mean?***, Repair Pal, May 14, 2018  
<https://repairpal.com/oil-change-indicator-light>